193-110-MG2-001

EOSDIS Core System Project

Procurement Management Plan for the ECS Project

August 1993

Hughes Applied Information Systems, Inc.
Landover, Maryland

Procurement Management Plan
for the
ECS Project

August 1993

Prepared Under Contract NAS5-60000
CDRL Item 010

SUBMITTED BY

Marshall A. Caplan, Project Manager Date
EOSDIS Core System Project

Hughes Applied Information Systems
Landover, Maryland

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Preface

This document is a formal contract deliverable with an approval code 2. As such, it does not require formal Government approval, however, the Government reserves the right to request changes within 45 days of the initial submittal or any subsequent revision. Changes to this document shall be made by document change notice (DCN) or by complete revision.

This document issue contains changes to the pre-approved release, dated May 1993. Substantive changes are indicated by change bars and noted on the List of Effective Pages. The document number has been changed to comply with the Data Management numbering system.

Once approved, this document shall be under the ECS Project Configuration Control. Any questions or proposed changes should be addressed to:

Data Management Office
The ECS Project Office
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*EDS was responsible for the generation of Section 6, COTS Procurement Process.

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1. Introduction

1.1 Identification

This Procurement Management Plan, Contract Data Requirement List (CDRL) item 010 whose requirements are specified in Data Item Description (DID) 110/MG2, ia a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) Engineering Development Contract (NAS5-60000).

1.2 Scope

This plan describes the methods, policies and procedures which will be used to plan, monitor and control ECS subcontractor performance effectively as well as the policies and procedures for conducting competitive and non-competitive procurements.

1.3 Purpose and Objectives

Subcontracts comprise a significant amount of the effort to be performed for ECS. It is therefore critical that the selection and management of subcontractors be executed in accordance with Federal Acquisition Regulations as well as corporate policies and practices.

As prime contractor for the EOSDIS Core System (ECS) Hughes has assembled a complementary team of major subcontractors consisting of Loral AeroSys (formerly Ford Aerospace), Electronic Data Systems (EDS), Engineering and Science Services, Inc., a subsidiary of the Center for Space and Advanced Technology (ESSi) Applied Research Corporation (ARC), NYMA and Hughes Technical Services Company (HTSC). Hughes has structured a highly visible senior staff of professionals with the experience necessary to meet the management challenges of ECS and thus ensure successful subcontractor performance. In addition, we anticipate that additional subcontractors may join the team, particularly other small/and small disadvantaged businesses, as opportunities arise. Furthermore, to encourage computer science research associated with the Earth sciences, we plan to involve educational institutions and this plan identifies the process for their participation.

1.4 Document Organization

The remainder of this document is organized as follows:

Section 2: Lists bibliographic references to associated compliance documents and other documents

Section 3: Provides the rationale for the composition of the Hughes ECS team.

Section 4: Describes an overview of the procurement system, including policies, procedures and processes for procurement planning, selection and award.

Section 5: Details the organization and responsibilities of the Subcontracts Management Office.

Section 6: Describes the process and procedures for the selection of COTS for ECS, for which EDS will serve as the procuring organization.

A list of abbreviations and acronyms appears at the end of this document.

2. Related Documentation

This procurement management plan is based on a system fully compliant with Government procurement processes and procedures. The documents which provide direction, guidance and information contributing to this plan are set forth:

2.1 Compliance Documents

Compliance documents are those which are mandatory in providing direction to the ECS Project procurement process and the manner in which it is managed.

Government Documents:

Federal Acquisition Regulations and NASA FAR Supplement

EOS Performance Assurance Requirements for ECS, GSFC 420-05 03, May 23, 1991

Federal Information Resources Management Regulation (FIRMR) - December 12, 1985

Corporate Documents:

Hughes Information Systems Material Manual 8MA3

Desktop Guide to Contractor Purchasing System Review (CPSR), EDS, Federal Corporation, Government Systems Group, May, 1, 1992 (Revised).

Project Specific Documents:

ECS Project Instructions

a) Subcontract Management

b) Subcontract Administration Request for Change (RFC) Processing Subcontractors

c) Subcontractor Performance Evaluation Board (PEB)

2.2 Other Documents

Other documents are those which are relevant to the ECS Project procurement operation:

Master Subcontracting Plan HAC 92-93

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3. Subcontractor Team Selection

Subcontractors for the Hughes Team were selected on the basis of complementary skills and experience. All have demonstrated successful performance on previous contracts as well as have an excellent prior experience base with NASA. As the opportunity arises, we intend to identify areas for additional subcontractors from small and small disadvantaged business in support areas such as engineering services and selected communications implementation.

Selection of the current subcontractor team for the ECS Project was the result of an extensive canvassing of the contractor community to assure that Hughes and the customer would have the best possible capabilities team available. In the spring of 1989, Hughes began the search for the required resources to complement its own capabilities for managing large systems development and for understanding the collection and processing of Earth surveillance data. Four fundamental areas of expertise/experience were identified: ability to make a commitment to the ECS Project; prior experience in the NASA environment; experience in Earth and near-Earth scientific research, support and instrumentation applications; and established knowledge of and powerful buying capabilities in the COTS hardware and software markets. In addition, physical proximity to NASA/GSFC was a primary concern to assure the closest possible contact and responsiveness to satisfying immediate needs. Collocation of the team in Landover satisfies this criterion.

The survey of candidates for joining the Hughes Team resulted in the selection of Loral Aerosys (formerly Ford Aerospace), Electronic Data Systems (EDS), Engineering and Science Services, Inc. (ESSi, a subsidiary of the Center for Space and Advanced Technology), Applied Research Corporation (ARC), and NYMA, Inc and Hughes Technical Services Company (HTSC). These companies were selected based on the criteria above with additional consideration given to their cost and schedule performance on other efforts, stability of the company and its workforce, and general compatibility with the Hughes work ethic. All major subcontracts are cost plus award fee, with the exception of HTSC who, as a subsidiary of Hughes Aircraft, has an internal corporate fixed fee agreement with Hughes Applied Information Systems, the contracting entity for ECS. (In compliance with the FAR, this fee is not a cost to the Government). Award fee from the Government to the Prime for team performance has been flowed down to the subcontractors to reinforce the integrated team approach.

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4. Procurement System Overview

4.1 Government Approved System (FAR PART 44)

Hughes Applied Information Systems, Inc. (HAIS), the prime contractor for the ECS Project, was spawned from Hughes Information Technology Company (HITC). Prior to its incorporation, all procurement for HAIS was accomplished through HITC and it is planned that all HAIS procurement will continue to be accomplished through HITC Materiel located in Aurora, Colorado. HITC Materiel was granted an interim procurement system approval through December 31, 1993 by the Defense Contract Management Area Operations (DCMAO)—Denver. Because the CPSR is not anticipated to be conducted no later than February 1994, they will expect to receive, at a minimum, a 90-day extension on their interim approval. HITC Materiel management has been actively working with DCMAO—Denver in terms of informal reviews of procurement practices and procedures. The Administrative Contracting Officer at DCMAO is Richard Van Dorn.

The HITC Materiel system is based upon the Hughes Corporate Command Media as expanded by operations/programmatic practices and procedures. The published practices provide specific guidance on every aspect of the procurement process as well as provide general guidance in the conduct of company and programmatic business.

For the immediate implementation of the ECS Project and the issuance of major subcontracts, subcontractual authority has been delegated to the ECS Manager of Subcontracts. The manager's responsibilities include: subcontract plans, solicitations, negotiation and administration. The manager is also responsible for ensuring that all subcontracting procurement actions comply with public law, federal regulations and the prime contract requirements. In addition, the Subcontract Management Office is responsible for compliance with the Government's socioeconomic program requirements with special emphasis on the promotion of small/small disadvantaged business concern participation on the ECS Project. HITC Materiel will prepare 294/295 Forms for ECS following review by the ECS Subcontracts Management office.

4.2 ECS Project Policies and Procedures

Drawing upon its extensive, long term experience in the management of major subcontracts on large, complex development programs, Hughes has evolved proven management methods and tools which will be adapted for ECS-unique requirements. This plan for procurement management takes maximum advantage of this experience in adapting existing methods for program use. Each adaptation or innovation is carefully evaluated to ensure that it supports the objective of assuring satisfaction of program objectives through strong subcontract management. Our goal is to maintain a balance between cost, schedule, quality, and performance requirements.

Hughes has a well established socioeconomic program based upon published policies and procedures. An effective company-wide organization administrators concentrates on maximizing small business opportunities in commercial as well as federal procurements. Qualified small, small-disadvantaged and woman-owned business concerns are identified for solicitation purposes via several ways: by the Company Supplier Directory; The U.S. Small Business Administration's Procurement Automated Source System; The Latin Business Association Membership Directory; by direct contact at various SBA or Government sponsored business fairs. Buying personnel and subcontract administrators are assisted in the identification of potential sources by the Company's Socioeconomic Programs Office network.

Furthermore, Hughes has incorporated provisions in procurements of $500,000 or more (except small business concerns) which require submission and adoption of a subcontracting plan similar to that submittal by Hughes in compliance with FAR 52.219-9.

4.3 Procurement Planning

Hughes' procurement policies and procedures emphasize the early identification and planning of project requirements to maximize lead time, identify risks, sort out uncertainties and allocate sufficient resources to accomplish project objectives within schedule constraints.

4.3.1 Technical Requirements

The scope of all prospected subcontracted efforts will be documented in a set of technical requirements that will describe the parameters of the envisioned subcontract. The technical requirements will be drafted by the cognizant engineering areas and reviewed as a whole by the system engineering and engineering management functions. The technical requirements will address as a minimum the necessary development, design, performance, testing, validation and support requirements of the scope to be subcontracted. These technical requirements will be used as the baseline for determining those companies that have a background that matches the technical requirements in order to produce a list of candidate companies.

4.3.2 Technical and Financial Credentials

Candidate companies will be evaluated with regard to their technical and financial credentials to be able to perform the envisioned subcontract. Technical credentials such as similar scope performed or similar systems developed or supplied will be reviewed. The present technical personnel within the company will be reviewed to determine their background, experience, availability and present work load.

Candidate companies will also be assessed with regard to their financial capability to perform the envisioned subcontract, including financial position and company credit performance. Present work load of the particular group being considered and their previous history of comparable size efforts will also be examined.

An estimate of the financial resources necessary to perform the envisioned subcontract will be prepared by the Hughes programmatic and financial functions with input from the technical functions regarding effort and schedule. This estimate will form the basis for comparison and

validation of several factors during the selection phase. These factors will include "should costs" for the effort and resources required of the potential subcontractor.

4.3.3 Make-or-Buy Decisions

The ECS Project make-or-buy program is intended to optimize the use of company and supplier-base resources to achieve a high level of performance, quality and utility in an efficient and cost-effective manner. The make-or-buy program supports the Hughes Team's fundamental commitment to the concept of open system architecture by focusing on the efficient application of COTS hardware and software products to satisfy ECS requirements.

The procedure starts with the identification of major/critical items which embody a potential risk to project cost or schedule or may result in degraded product performance. All items of work valued over $500,000 are automatically subjected to make/buy analysis.

Make-or-buy plans are formulated by the ECS Business Operations Office based on data inputs from various company organizations. The Subcontracts Management Office (SMO) furnishes available vendor technical, cost, schedule and past performance data to support the make/buy plan. Data on in-house capabilities is obtained from the responsible performing organization.

Completed make-or-buy plans are then presented to the ECS project manager who makes his decision with the advice of a board made up of senior management and technical personnel. Decision criteria to be considered may include:

Specification compliance

Assessment of delivery schedule

Availability of manpower and other resources

Cost Assessment

Customer preferences

Minutes of the meeting are maintained as a formal record of the proceedings.

4.3.4 Procurement Documentation

All procurement requirements will be documented to a level required to accurately record the effort to be procured. and meet Company and Government requirements. As a minimum, this will include a request for quotation or proposal, depending on the complexity. All more complex procurements will require the following as applicable, a statement of work (SOW), work breakdown structure (WBS), specification, data requirements and schedules of the period of performance.

In order to ensure compliance, all prime solicitation provisions and contract statement of work tasks are subjected to review and analysis. A matrix relating ECS contract WBS elements, SOW paragraphs and subcontractor tasks is constructed, and this matrix is used by the subcontracts manager, with assistance by the project element technical staff, to construct the subcontract statements of work, thus ensuring the completeness of flowdown and relevance to the project

objectives. It also serves as a yardstick against which subcontractor progress will be measured and overall performance evaluated.

4.3.4.1 Procurement Documentation Generation

The SMO shall be responsible for generating the request for proposal, instruction to offerors, line item structure, terms and conditions and delivery requirements. Product Assurance provides any quality assurance requirements. The ECS Project office, through the subcontract management function shall be responsible for generating the statement of work and program performance schedules. The ECS Project office, through the financial function shall be responsible for developing the work breakdown structure. As appropriate either System or Segment Engineering will be responsible for producing the specification for the effort to be subcontracted. Data Management will be responsible for generating the subcontract data requirements list. In the case of COTS procurements, the associated documentation shall be provided by EDS and reviewed by the SMO. This shall include Requests for Comment, Requests for Proposal, evaluation criteria and selection documentation, terms and conditions and delivery requirements.

4.3.4.2 Procurement Documentation Review

Each part of the documentation shall go through an internal review process within the management of the functional group charged with its generation. The purpose of this review will be to check and address content of the requirements. This review should make sure that requirements are expressed in clear and measurable terms. All of the generated documents will go through a further review process by the subcontract management function and the program management function to check for conflict and confusion across the requirements. This review also ensures that the procurement requirements have been stated in a clear and understandable manner that the bidders can answer.

4.3.4.3 Procurement Documentation Control

Once documentation has been generated and reviewed, it shall be placed under configuration control with the subcontract management function. The subcontract management function is charged as the focal point for control of the documentation baseline released and sent to the bidders during the competition phase. The subcontract management function ensures control between the current procurement requirements and the current proposal from the bidder. Configuration control of such documents shall remain under the authority of the subcontract management function until the award of the subcontract effort, at which time the various documents shall be controlled by the responsible functional areas in accordance with the prime contract.

4.3.4.4 Procurement Documentation Content

Each procurement package will contain the following items:

- The request for proposal contains the instructions to bidders, all bidding ground rules and assumptions, the time frame when the bid is due, and a proposal schedule that shows meetings, events, submittals, etc. It identifies the items to be proposed including quantity,

as appropriate, delivery requirements, and periods of performance. In selected COTS procurements, an indefinite delivery and indefinite quantity may be solicited to provide flexibility in ordering and to achieve better pricing. It should include any applicable terms and conditions of the procurement. It should provide a list of attachments that will allow the bidder to account for receipt and understand the relationship of all attachments.

- The statement of work describes the labor that is to be performed by the bidder as part of the procurement. It should address all functional areas that will be involved by the bidder during the procurement. This shall include all programmatic, business, quality, technical, and logistical efforts. The statement of work shall identify periods and places of performance, quantities and levels of deliverables, formats and conditions of deliveries, on-going support and provisioning requirements, and any other elements of human effort that must be performed.
- The specification and/or drawings shall document the characteristics and performance required of the product to be produced. The product can take many forms, but in all cases, some level of performance needs to be established. The specification should include design, development, test, integration, installation, check-out and operation as is applicable to the product.
- The data requirements list identifies the deliverable data requirements that document the procurement. These requirements can be managerial, technical, verification, training, maintenance, operations and/or quality related. The data requirements will specify the scope, content, format, quantity, delivery and quantity of the data required.
- Overall ECS Project Master Schedule that defines the procurement schedule shall be generated as part of the procurement documentation. These schedules should be of sufficient detail to inform the bidder of the period of performance and time frames, deliveries that must be met, but not of such detail as to force the bidder into a particular series of events. The bidder must have enough flexibility to plan and propose schedules to fulfill the overall schedule supplied.

It is the policy of the ECS Project that whenever and wherever possible all procurements will be made on a competitive basis. Offerors shall be identified from multiple sources, including the Hughes Vendor Information System, and an ECS-maintained file of companies who have presented their qualifications and experience. In the absence of known potential sources, advertisement of the solicitation shall be made. A sufficient number of bidders shall be solicited, however, competition shall involve at least two compliant bids for the procurement under consideration. Proposals shall be evaluated and judged on a "lowest total cost basis" life cycle costs, to the entity making the award. This does not necessarily imply the lowest price bid, as there are times when the "total cost" of a procurement may be affected by factors other than just the price bid. This is also referred to as “best value” and may take into account other factors such as standards compliance, technical merit, and past performance. All bidders shall be given an equal baseline from which to bid and equal time in which to receive, review, question and prepare their bids. Any information provided to one bidder shall be provided to all bidders.

4.3.5 Sole Source Solicitations

In selected circumstances, sole source awards will be required. These awards arise out of the unique or specific background or capability of certain suppliers. In the cases where sole source awards are determined to be in the best interest of the ECS Project, such awards will be made after a full review of the designated company's qualifications, previous experience, effort and cost basis. One of the major criteria that will be considered before a sole source award will be the benefit that the ECS Project will receive from taking this course of action. A written justification for a sole source selection is required by the requestor and is subject to the approval of the ECS Project Manager.

4.3.6 Small/Small, Disadvantaged Business Goals

It is the policy of the ECS Project to support small and small disadvantaged businesses. All ECS Project procurements above the designated threshold ($500,000 and those which are not small or small disadvantaged business) will require the bidders to submit a subcontract small and small disadvantaged business plan as part of their proposal. The plans will identify the goals the bidder intends to meet in relation to promoting business both directly and indirectly with small and small disadvantaged businesses. These plans and the commitment levels proposed in the plans, will be part of the evaluation criteria in competitive awards and subject to negotiation in sole source awards. The Subcontracting plan will be subject to negotiation in both competitive and sole source awards.

Once under subcontract the supplier will report on a periodic basis their progress toward achieving their commitment for small and small disadvantaged business. The suppliers progress toward achieving these commitments shall be reviewed and will form part of the performance rating by the buyer.

Under its original proposal, Hughes had allocated 20% of its total subcontract dollars to small and small disadvantaged business. This is further broken down as 15.6% to disadvantaged business and 4.4% to non disadvantaged business. The Hughes ECS Project Office has compiled an extensive "talent-pool" list of small/small disadvantaged business suppliers who have expressed interest in participating on various aspects of ECS. We intend to continue to expand this list, and as requirements are identified, are committed to maintaining the same high level of small/small disadvantaged business participation.

4.4 Procurement Process

All ECS Project procurements will require that prospective suppliers submit a proposal responsive to the requirements identified in the request for proposal. Proposals will vary depending upon the size, complexity and risk of the effort to be procured, however they will usually contain sections that address the technical, management and cost elements of the effort.

Technical Volume

All ECS Project procurements will require a technical volume as part of the bidders proposal. It must include a discussion of the bidders approach to meeting the requirements of the

contemplated effort the technical approach should be specific, detailed and complete enough to clearly and fully demonstrate that the bidder understands the requirements and the inherent problems associated with the objectives of the procurement. It should include the rationale for the approaches including analysis, simulations and/or trade-offs performed to define the approach. The approach should describe the engineering process to be applied, including assumptions, methodologies, implementation and performance processes, as appropriate.

Management Volume

ECS Project procurements shall include a management section describing the organization that will be responsible to perform the effort to be procured. This section shall describe the organizational structure, including charts and physical location, size and relationship of the components within the organization.

The management volume shall identify the key responsibilities and key personnel of the organization. It shall define clear and objective lines of responsibility, authority and communication. If additional staffing is required, the proposal shall identify and provide a plan on how this will be achieved, including size, skill, and time to staff the organization, as appropriate.

It shall contain information relative to the state of the business such as, relevant past performance, financial conditions and capability, availability of resources and relevant experience in the field.

Cost Volume

ECS program procurements will require a cost proposal volume, duly executed by an official of the bidder with the authority to commit the company. Cost proposals shall be complete, separate volume from the technical and/or management proposal. It shall provide a complete and detailed presentation of the costs necessary to perform the effort to be procured in a format that breaks the work down into recognized work packages and also in a format that provides the types of cost as they will be incurred over time.

Cost proposals shall identify all costs with specific detail of the following type: labor, both direct and indirect, materials, fabricated parts, subcontracted efforts, other direct costs including travel, computer, test equipment, etc., overheads and burdens, cost of money and profit/fee applied to the cost, as appropriate.

Best and Final Offers

Best and final offers may be requested when the ECS Project management feels that it is in the best interest of the program to do so. Procurements may be awarded directly from the receipt of the best and final offer or it may be negotiated once a company has been selected. Best and Final Offers will generally consist of an update to the initial offer that accounts for all the changes, clarification, modifications that have taken place since the submittal of the initial offer.

Clarification

Clarification to proposals may be required. These may be issued as results of the evaluation of the bidders proposals and may address any part of any of the proposals. Usually they request the bidder to take further action in describing the plans for accomplishing the effort to be procured.

Clarification requests normally are used when a need arises for more information or to clarify confusing information in a bidders proposal. They may take the form of requests for written clarification, oral discussions, or visual presentations. Usually, a clarification request is issued for an item that is required before the evaluation of a proposal can be completed. Normally the CR will include a time period for the bidder to take action.

4.5 Procurement Selection

Evaluation teams will be established for each of the proposal areas, technical, management, and cost. These teams establish the evaluation criteria, evaluate the proposals and rank the bidders in reference to the best proposal. They are made up of a cross section of personnel with the correct backgrounds to be knowledgeable about the area they will evaluate. These criteria will be an established and measurable element of the proposals. Evaluation criteria shall be the same for all bidders and proposals.

Technical Evaluation Team

The technical evaluation team determines the evaluation criteria for the technical proposal. In most cases, this team will be comprised of members of system engineering, segment engineering and performance assurance. Their purpose is to rate the bidders' proposals and the envisioned technical performance of the system and the bidder.

Management Evaluation Team

The management proposal evaluation team determines the evaluation criteria for the management proposal. It shall be comprised of members of the business operations office and subcontracts management office. They review corporate past performance reports commitment to the effort and key personnel. They consider how the bidders can adhere to cost and schedule control.

Cost Evaluation Team

The cost proposal evaluation team will determine the evaluation criteria for the cost proposal. This team evaluates the bidders' cost proposals for the "realism" of the costs. This may include items such as, identification of missing, and uncosted elements, probable costs to the customer, consistency of cost to the propose scope of effort and whether costs are over or under stated.

Cost or price analysis is required for all procurements over $1,000. Cost analysis is performed whenever cost or pricing data are required or when reasonableness of a proposed price cannot be determined through price analysis techniques. When the existence of adequate price competition can be demonstrated and the procurement will be awarded to the bidder with the lowest evaluated price, no further price or cost analysis is required. Cost analysis is normally performed

by the group price/cost analysis section with support from Corporate Subcontract Audit (when permitted by the bidder) or by the cognizant Government audit agency.

4.5.1 Cost Price Analysis

Upon submission of proposals, over $500,000 Hughes will either audit the cost and pricing data itself, or request an assist audit form DCAA when proprietary data rights are asserted. The results of this analysis shall be used during negotiations.

4.5.2 Award

The evaluation teams present their respective scoring to the Source Selection Board (SSB) which is composed of the ECS Project Manager, the Deputy Project Manager, and the Manager of Subcontracts. The SSB has the final authority for selection. The SSB must document their selection citing the basis and rationale for the selection. GSFC Contracting Officer must grant consent-to-issue in writing prior to award.

4.5.3 Negotiation

All sole source and selected competitive procurements will be negotiated. Negotiations may cover any and all aspects of the procurement, ranging from scope of the effort, responsibilities for performance, terms and conditions of the contract, costs and price, periods of performance, etc.

Negotiations will involve a "fact-finding" period, in which the bidders offer is evaluated and checked for current and complete information. A "pre-negotiation" review will take place with the procuring companies management. Areas and issues expected to be discussed in the negotiation will be reviewed and documented with positions and ranges established for the negotiation. The pre-negotiation objectives shall be approved by the ECS Program Manager.

Negotiations will be documented in a negotiation summary. This summary provides an accurate history of the negotiations, and documents positions and agreements made by both parties in order to establish the understandings to which the procurement is awarded.

4.5.4 Debriefing

Upon request, unsuccessful bidders are entitled to a private debriefing that covers to whom the award was made and the criteria for selection of the winning offeror. It should include a review of the unsuccessful bidders strengths and weaknesses. All efforts will be made to answer any questions from unsuccessful bidders. The procurement award value of the winning bidder shall not be disclosed.

4.6 Educational Institutions Participation in ECS

To encourage computer science research and education associated with the Earth sciences, and to apply this capability in facilitating multidisciplinary research, Hughes intends to establish subcontractural relationships with the Universities Space Research Association’s (USRA),

Center of Excellence in Space Data and Information Sciences (CESDIS) and with the National Research Council (NRC). Their roles are:

CESDIS will administer a program for junior and senior level faculty and graduate student positions; and

NRC will administer a post-doctoral associateship program for independent research at ECS.

Judicious funding of academic institutions via subcontracts with CESDIS and NRC will foster science community involvement in the ECS development process. Academic institutions that can become involved with the ECS activity include all U.S. or foreign colleges or universities or research centers sponsored by a college or university. Foreign universities will be considered when there is a unique capability available. The benefits of establishing relationships with researchers from these academic institutions include:

- Science community participation in the development and deployment of the ECS
- Allow the development of the ECS to draw on the expertise and knowledge base of the science community
- Further NASA educational goals concerning science and technology

Independent research will be encouraged through a proposed subcontract from Hughes to the NRC for post-graduate research associates (junior or senior) to join ECS for a 1 to 2 year period renewable by mutual agreement on an annual basis. The purpose of the subcontract to NRC is to administer the evaluation, selection, and suncontract administration (including salary and benefits). The NRC performs similar functions for NASA through the NASA Resident Research Associates program.

Innovative research will be encouraged in both the Earth and computer sciences. The primary objective of these research efforts is to provide insight into technological advances in computer sciences that can serve the evolving long term needs of the Earth science community. NRC will advertise the areas of interest for these positions through various media.

Focused research will also be encouraged through a proposed subcontract from Hughes to USRA to support junior and senior level faculty and graduate student intern positions for a 1 to 2 year period renewable by mutual agreement on an annual basis. As with the NRC subcontract, the purpose of the USRA subcontract is to manage the evaluation and fiscal administration (including salary and benefits) of the internship program. USRA performs a similar function through the administration of the CESDIS program which manages at GSFC.

Representative tasks expected to be considered through the focused ECS internship program include:

- Computer science projects
  - Human-computer interfaces
  - Large data bases
  - Software reuse technology

- Data compression

- Earth science projects
  - Browse operations concepts and algorithm development
  - Data fusion
  - Conceptual data models for facilitating Earth science research
  - Data visualization
  - Prototype evaluation

As the ECS Project evolves, additional tasks will be identified as potential areas for subcontracting.

The process of selection for both the NRC ECS associates and the ECS interns starts with submission of a short (usually 4 page) proposal to NRC or in response to a general requirement developed by Hughes. NRC and CESDIS will then publicize this requirement through an Announcement of Opportunity (AO) and will request short proposals. The subcontractor, NRC or CESDIS, convenes panels of knowledgeable peers, to provide objective evaluation of the proposals. Special consideration will be provided for favorable evaluation of proposals for HBCU (Historically Black Colleges and Universities) and MI (Minority Institutions). A list of the recommended associates is then sent to the ECS Science Office for final approval. The ECS project scientist reviews the list with both the EOS program and project scientists before final selection is made.

The opportunity also exists, through CESDIS, for the COTR to identify selected faculty who because of their current expertise, could benefit the goals and objectives of ECS. In those cases, similar to a sole source, a memorandum from the Science Office details the motivation and rationale.

In selected cases, Hughes envisions sole source awards to universities where a unique technology or expertise is established that would provide clear benefit to the ECS Project. A statement of work and project plan (including cost and schedule data) would be submitted for consideration. The appropriate technical office manager would be responsible for preparing a brief justification on this directed source award. Prior approval from the ECS Project Manager is required.

Technical guidance for the associates and interns will be focused in the ECS Science Office through the leadership of the ECS project scientist. However, other engineering elements within ECS may provide the day-to-day guidance, depending upon the nature of the work and expertise required.

In all cases, coordination with the COTR, and the approval of the Contracting Officer are required.

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5. Subcontracts Management Organization

5.1 Organization of Subcontracts Management Office

The objective of the Hughes Subcontract Management Office (SMO) is to ensure the proper planning, coordination and reporting of the subcontracted efforts. Each subcontracts manager/administrator provides management focus and high visibility into all subcontractor activities. The SMO has the formal authority to direct and control each of the subcontractors and to ensure that each subcontractor's functional area is in synchrony with the overall project direction. It works closely with the appropriate office manager who provides daily direction and guidance to the subcontractors. With the degree of anticipated change, project communications are of paramount importance and the integrated, collocated team approach promotes the insertion of the highest quality into the final product by ensuring a maximum degree of participation and consensus building. Given the complexity and magnitude of ECS, an integrated team with mutually compatible objectives, strategies, plans, and incentives combined with well defined subcontractor responsibilities, reduces the risk and minimizes the conflict often experienced in large, multisubcontractor programs.

SMO ensures subcontractor performance is compliant with subcontract, SOW, ECS requirements and related documents. The Manager of Subcontracts has the responsibility for overall performance of the subcontractors across the project and serves as the formal management interface as well as the advocate for the subcontractors in the ECS Project Office. The SMO consists of the manager and three subcontract managers/admin (SMs). Pooling their collective experience ensures the smooth operation of the SMO. The SM has responsibility for subcontractor activities, monitors performance, and assists in resolving issues. In accordance with ECS program instructions subcontractor activities are monitored through SM participation in technical review meetings, as appropriate, monthly subcontractor progress reviews, and reviews of the Performance Measurement System (PMS) reports. Involvement with subcontractor activities allows the SM to understand potential implications for a subcontractor's SOW and to appraise technical managers of areas that are changed or otherwise contractually nonbinding.

The collocated team maximizes the general flow of information through shared documentation, data bases, tools, and an integrated information management system; the ready availability of team members for rapid decision making; and easy access to appropriate management levels for daily operational resource allocation and resolution of technical issues.

In conformance with the integrated team structure, subcontractors will receive two forms of communication: technical direction/clarification, and formal directives. The first will come from the designated technical officer managers primarily in the form of work direction. In designing and implementing each segment, technical office managers will direct the segment team which will be composed of Hughes and subcontractor staff. Thus the flow down of requirements to the

subcontractors essentially becomes a relative non-issue since the design and development teams are comprised of prime and subcontractor staff.

Formal directives originate from the technical office managers or the project manager to the SMs, such as conveying a formal requirements specification to the subcontractor or issuance of subcontract change orders or amendments. In this mode, the flowdown of out-of-scope requirements as they impact each subcontractor's SOW and project cost profile, needs to be reflected contractually. Formal signoff authority on subcontractor products resides within the SMO with prior review by the appropriate Hughes technical mangers.

In those cases where conflict does arise between the prime and a subcontractor or between subcontractors that cannot be resolved at the working group level, the DOS serves as the focal point for mediation. In this capacity, the DOS considers the issue from a broad, project perspective, assists in articulating the relative merits and tradeoffs, and facilitates a decision through consensus. Resolution of technical issues also involves the chief systems engineer, whereas cost issues may involve a representative from theBusiness Operations Office. If the issue still remains open, it is then presented to the ECS Project Manager who has final decision making authority. The SMO has prime responsibility to ensure that subcontract problems are identified and resolved in a timely manner.

The subcontract manager ensures the implementation of requirements contained in the subcontract. The statement of work, the subcontractor's data requirements list (SDRL), and the procurement specification establish the primary baseline from which the subcontract is managed. Complete visibility and a thorough understanding of the subcontractor's overall operation, is maintained by the Hughes subcontract manager. This is considerably simplified since all subcontractors will be using the same PMS package supplies by Hughes. The SMO within the Hughes organization is shown in Figure 5-1. The organization of the SMO is depicted in Figure 5-2.

As part of the integrated team, subcontractors will staff the individual segments; each subcontractor will also have designated WBS elements, SCDRLs, and work packages that will enable the segment and engineering managers to track performance at the detailed WBS level, and the Manager of Subcontracts to monitor the overall performance (cost, schedule and technical) of each subcontract across the program.

5.2 Planning/Budgets/Scheduling

Subcontractors will be separately measured and integrated into the contract work breakdown structure (CWBS) and CWBS dictionary as appropriate. The subcontractors work packages and cost accounts will be established as if the subcontractor were part of the prime contractor, but each subcontractor will develop plans for accomplishing its work defined by their respective subcontract statements of work. Once a subcontractor's plan is approved by the prime contractor's management, it is issued a work authorization. Any changes, revisions or schedule replanning will require ECS Project Office approval.

Each subcontractor will be required to provide the same level of budget and schedule planning as Hughes cost account managers. The subcontractors will be required to conform to the prime's procedure for establishing budgets and schedule baselines.

As part of the integrated team, each subcontractor shall conform to the schedules, methodologies and tools to plan and control the project.

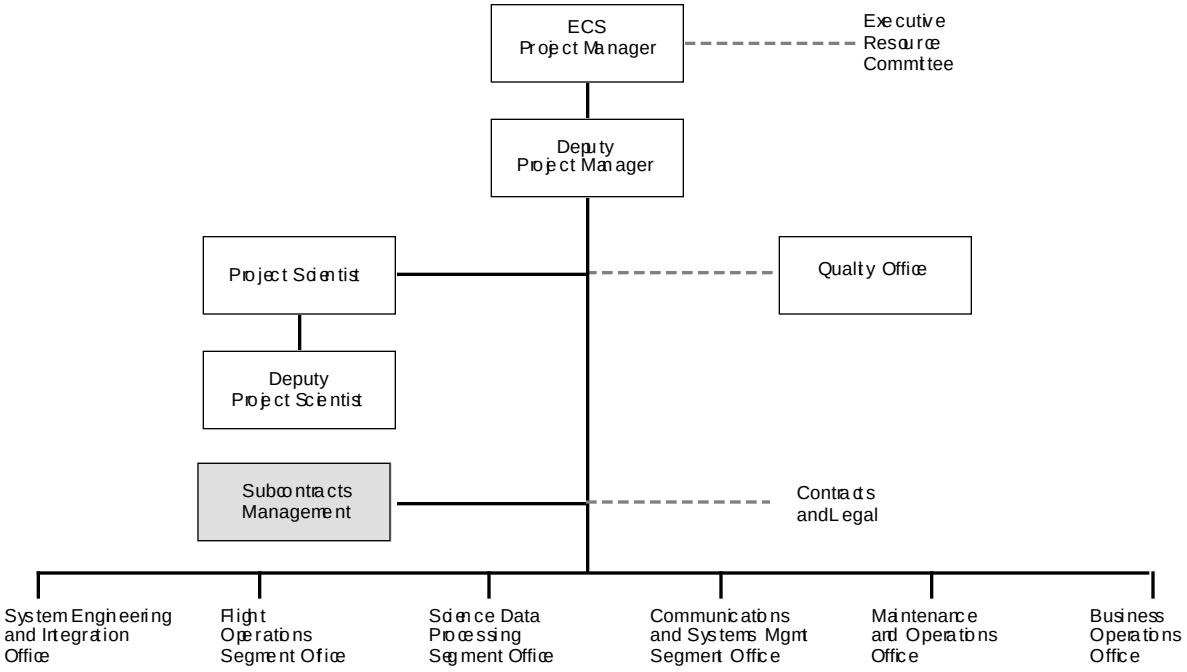

Figure 5-1. The Hughes ECS Project Organization

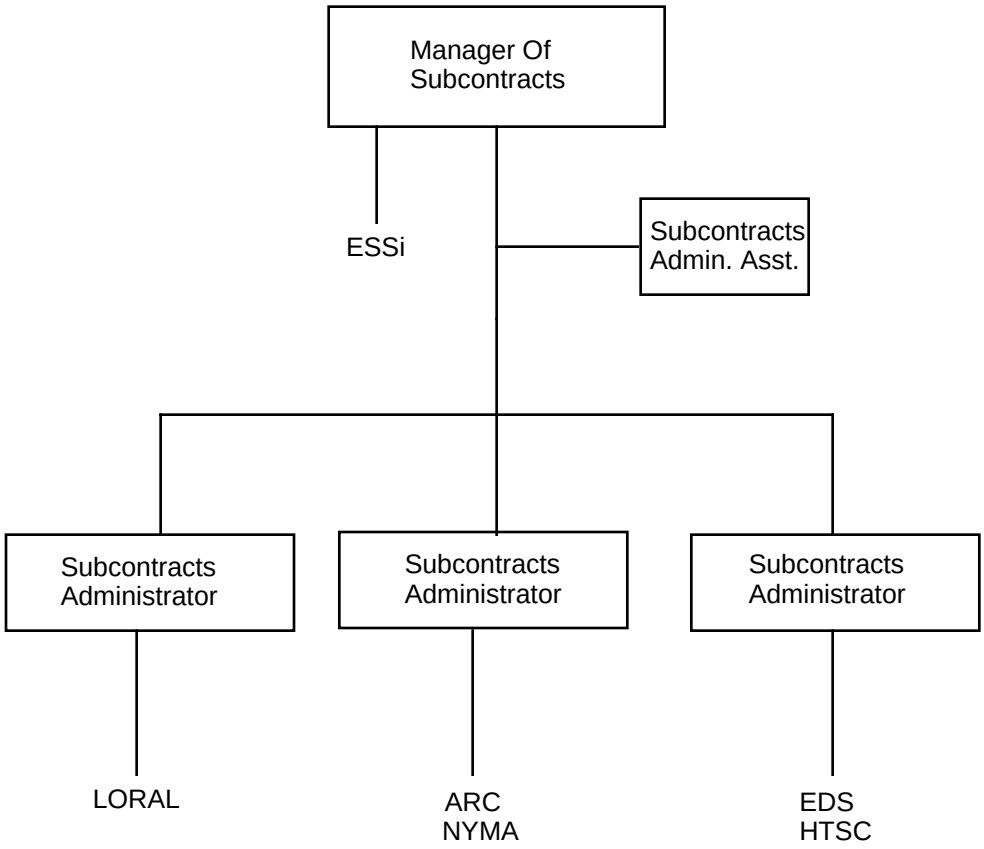

Figure 5-2. Subcontracts Management Office Organization

The subcontractor implements the financial section of his management plan by developing a time phased expenditure plan to include the establishment of earned value type accounts for all elements that comprise the subcontract price. Budgets of labor hours and dollars across the total program must extend to the same level and must be consistent with detailed schedules. The detailed time phased budget plan is required within 60 days after subcontract award and is updated on a periodic basis or when major changes make the current expenditure plan obsolete.

Labor hours and dollar budgets negotiated by the subcontractor with Hughes cannot be changed without prior approval. Reports by the subcontractor are prepared reflecting the actual hours and dollar expenditures (actual cost of work performed) against planned expenditures (budgeted cost of work scheduled) and work accomplished (budgeted cost of work performed). This budgeting and reporting level is required to the activity level considered necessary by the subcontract manager to provide adequate measurement of cost/schedule performance consistent with the detailed schedule agreed to between the parties.

5.2.1 Performance Measurement System

Subcontractors uniformly use the Performance Measurement System (PMS) supplied by Hughes in accordance with the *Performance Measurement System Handbook* GHB5112.1. Weekly reporting will consist of providing a brief status on work packages and milestone starts, progress, and completions. Cost account managers for each segment and engineering area, will have estimated resource allocations for work packages and these will be similarly monitored. In addition, each subcontractor will have its own cost account with the ability to track and report resources expended. All managers will have direct access to the data online, and thus can assess status from their desk top on an as-needed basis. Formal reporting will occur monthly and will include contract to date, year-to-date performance and variances, if any, and the results of corrective actions as needed, among other parameters. Each subcontractor will be required to complete a SDRD for 533M, 533Q and 533P with signatures for submission to Hughes.

Subcontractor performance will be addressed on two levels. The first, or vertical level, will be by segment, system engineering, program support, or maintenance and operations. This will enable managers and the subcontractor to measure its performance within the appropriate segment or engineering area. The second, or horizontal level, will be across the ECS Project and will focus on overall subcontractor performance in all the areas in which thatsubcontractor contributes, whether it be in the Project Science Office, a specific segment, System Engineering, Program Support Services, or operations and maintenance.

5.2.2 Progress Reviews and Reports

Monthly Status Reviews — These reviews will be required throughout the life of the ECS Project to ensure that the subcontractor's performance is compliant with the overall ECS Project performance plan. These reviews and reports are structured to provide the following information, at a minimum:

a. A cost performance summary, including explanations of any significant cost variances and reasons relating to the same.

b. The status of all technical accomplishments since the last review, and reasons for non-occurrence of previously anticipated milestones.

c. The status of quality assurance activities in terms of identifying trends, potential deficiencies, and corrective measures.

d. A schedule analysis, including discussions of all planned work since the last review.

e. Identification of any work-around plans that have been implemented to minimize schedule slippage.

f. Including identification of problems or potential issues and corrective actions taken or contemplated.

Technical Project Reviews — These reviews are held to review segment specific and engineering progress, performance against plan, and technical issues. Subcontractor's project managers are invited to attend these meetings to gain an overall perspective on program status, directions and issues.

Status Reports — Subcontract reports submitted by the subcontractor represent a significant means of monitoring subcontractor performance; therefore, it is imperative that reports accurately depicting the status of the subcontract program be submitted in a timely manner. To ensure the subcontractor's system is accurate, it is essential that the subcontractor have a closed loop system of internal reporting which compares cost and schedule progress against planned milestones and budget. This system is documented in the subcontractor's management plan and is implemented immediately upon the subcontract award. The focal point for this information is the subcontractor's program manager who has complete knowledge of the program status and the responsibility to keep the project subcontract manager fully informed on subcontract progress.

Report Analysis — All management control reports are thoroughly reviewed and a determination is made as to the "health" of the subcontract program. The status of the subcontract is presented to project management by the subcontract manager on a regularly scheduled basis. Presentations include cost and schedule status, problem areas, and any open action items that are affecting subcontractor performance. Where a deviation between planned and actual expenditures and milestone achievements occurs, a course of action is recommended. If it is determined that an adverse trend may be developing, a more comprehensive in-depth program status review may be scheduled to fully analyze the status and initiate any corrective action necessary to bring the subcontract back within cost and schedule objectives. Project system engineers provide the team's technical leadership during final system integration and test including sell-off of the (unit/subsystem).

During the design review process project engineers systematically evaluate subcontractor's designs against subcontract requirements to verify acceptability of the design approach. Such evaluations and verifications are accomplished at schedule milestones, with appropriate emphasis on all phases of activity from early concept formulation to design of the final deliverable. The two key milestones in this process are the preliminary design review (PDR) and the critical design review (CDR). Both of these reviews are conducted in advance of and support the segment level reviews.

Subcontractors participate in formal segment design reviews conducted by Hughes for the customer. Subcontractor representatives at these reviews include engineering, personnel as necessary to present, assess or simply be aware of system development, in accordance with their SOW.

5.2.3 Quality Assurance

Quality assurance controls are addressed through subcontractor adherence to prime contract requirements as part of the integrated team, including the EOS Performance Assurance Requirements for ECS, GSFC 420-05-03 These controls are reflected in the subcontract document itself via flowdown of NASA FAR and in various functional reviews by ECS Project Quality Assurance personnel (see Quality Assurance Plan for specific details). Woven into each area for each Subcontractor are mechanisms for acceptance. Additionally, the status of formal quality inspections will be reviewed as part of the monthly status reviews with the subcontractors.

Two kinds of products are anticipated from subcontractors: SCLINs and SDRLs, and COTS hardware and software. In the first category, Hughes will define each SDRL and provide the appropriate DIDs to its subcontractors. Acceptance will include sign-off by representatives from the appropriate project office , the appropriate technical manager (e.g., Segment Manager for the Science Data Processing Segment), and the manager of subcontracts.

The second product is the COTS hardware and software which will be handled in its entirety by EDS. EDS will draw on its internal, established procedures and processes to support procurement for the EOS Project. This is discussed in greater detail in Section 6, COTS Procurement Management. However, in addition to EDS' quality assurance program, Hughes will formally accept COTS hardware and software with necessary approvals from the appropriate technical office manager and the SM. This consists of reviewing the requirements, assessing actual performance data for the hardware and software, and substantiating price targets and delivery schedules. The integrated team approach and the defined process that the Hughes Team will follow for COTS evaluation and selection will facilitate the approval process.

In addition, Hughes has included in all its subcontractors' SOWs a statement concerning metrics definition, measurement and implementation to improve productivity and performance in accordance with their areas of contribution or responsibility

5.2.4 Data and Configuration Controls

The SDRL specifically identifies all subcontractor reports and data submittal requirements. Care is exercised to ensure that all required reports are truly useful and cost-effective and comply with both the SOW and SDRL.

Clear contractual requirements will be provided for establishing configuration baselines and for controlling changes thereto. Subcontractors adhere to the configuration and data management plans and procedures of Hughes as part of the integrated team. EDS will establish the baseline for COTS configuration management and will maintain that baseline within the centralized project facility. The benefits of the integrated team approach are evident here through the common use of a comprehensive set of tools and databases. Given the high rate of change anticipated during the life time of ECS, the integrated team concept reinforces the ability to maintain a cost-effective configuration management system.

The advantages of collocating the integrated team are evident in the ability to share data bases and tools and to involve team members directly in the process to develop a common understanding of requirements beyond what is specified in the formal requirements documents.

5.2.5 Management Leverage

Subcontractors with the exception of HTSC and any level-of-effort subcontractors, will participate in a two-tiered award fee. Twenty percent of the award fee pool shall reflect the award fee received by the prime. This reinforces the importance of working together as an integrated, cohesive team. The second portion of the award fee, or eighty percent of the award fee pool, shall reflect the subcontractor's performance against specific criteria established for the tri-annual performance period in advance and presented to the subcontractor. The specific

process for subcontractor performance evaluation is described in ECS Project Instruction Subcontractor Performance Evaluation Board.

5.2.6 GSFC Visibility

Open communications include all team members providing government awareness of subcontractor activity and performance. GSFC will be provided direct access to the proper individuals within the Hughes Team for technical exchange, regardless of the company they represent. In order to report and track Government contacts, a contact data base, accessible project-wide, identifies significant contacts (such as those that clarify points or impart new information) by date and reports the content of the communication. This open door policy reflects our commitment to the integrated team and affords GSFC the ability to communicate directly with members of the Hughes Team on a day-to-day, information sharing basis. However, subcontractors can only take direction from Hughes as the prime contractor.

GSFC will also have the ability to review individual subcontractor activities through their overall functional assignments, unique assignment of WBS, and their designated CDRL responsibilities. Subcontractor monthly status reviews covering project status, technical progress against plan, cost/schedule performance against plan, and quality assurance activities in terms of identifying trends, potential deficiencies, and corrective measures provide the means to monitor and assess overall subcontractor performance on a regular, formal basis. Subcontractor performance is also included in the Hughes' monthly progress report to the Government as well as in the semi-annual audit reports.

6. COTS Procurement Process

6.1 Purpose

This section documents the selection, procurement, and management of the EDS activities in support of the ECS COTS procurement process. The objective is to provide management guidance and procedural references for COTS procurement implementation and maintenance. COTS procurement is the largest and most critical aspect of procurement in support of ECS.

6.2 Organizational Support

The EDS corporate infrastructure provides development, testing, procurement, and product maintenance support. Support for the ECS Project will be provided by the EDS internal organizations described below:

- The Finance and Administration Group (F&AG) contains the EDS Purchasing Division (EPD). EPD's objective is to provide corporate-wide support for the procurement of products and services, including leveraging corporate buying power to achieve the most competitive prices available. EPD will assist the ECS Project in developing multiple supplier participation to encourage competitiveness and to negotiate volume discounts which are passed onto the customer. ECS will also utilize the more than 8,000 supplier agreements and approximately 300 master agreements with firms in the computer marketplace which are maintained and managed by EPD.
- The Technical Support Group (TSG) contains the Infrastructure Engineering Division (IED) and the Technology Architecture Division (TAD). IED and TAD provide the core technical assessment for all computing and communications in which EDS is involved. TSG will provide the ECS Project with independent data on new products and emerging technology information. New product data is collected by installing, testing, and analyzing new product performance. Recommendations are supported by specific evidence of product performance without vendor bias.

Figure 6-1 illustrates the interface between the EDS corporate infrastructure and the ECS/EDS Project. Within each ECS office, EDS had dedicated staff who work as a part of the team to ensure the requirements are well understood and represented in the vendor solicitations.

6.3 COTS Procurement Process

The COTS procurement process will require a continuous interface between EDS, HAIS, the segment design teams (SDTs), GSFC, and the vendor community, as illustrated in Table 6-1 and Figure 6-2. The EDS COTS Procurement Cycle (Table 6-1) provides a brief overview of the procurement activities required, the interface groups involved, and the group(s) responsible for

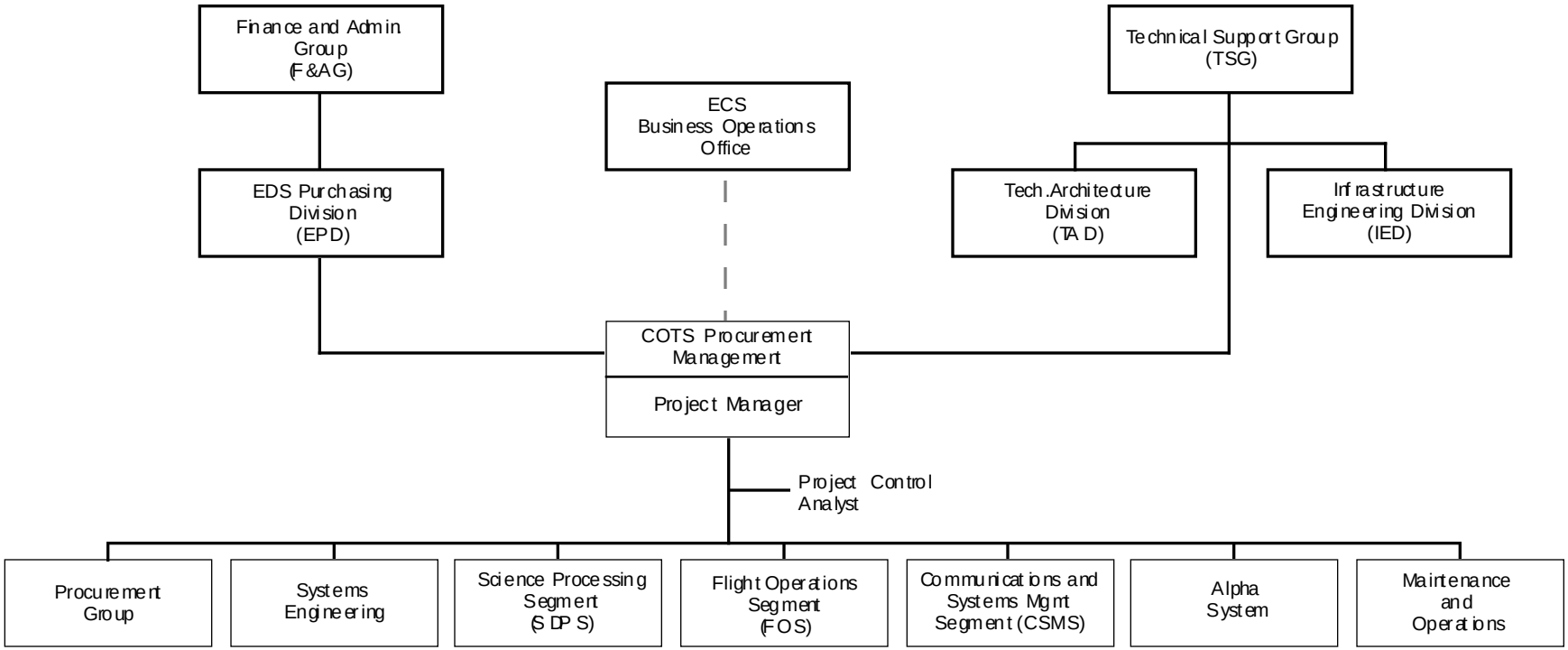

Figure 6-1. EDS COTS Organization Chart

each activity. The procurement cycle corresponds with the overall ECS Procurement Process Flow (Figure 6-2). Additionally, these illustrations directly parallel the following paragraphs,which provide a step-by-step outline of the COTS procurement process.

Table 6-1. ECS COTS Procurement Cycle

Interface Group	Activity		Responsibility
Segment Design Team (SDT) Goddard Space Flight Center (GSFC)	5.4 5.5 5.5.1 5.6 5.7	Requirements Gathering Analysis Logical Design Cost Model/Technology Assessment Issue Request for Information (RFIs) Incremental Design Review & Subcontractor Approval	SDT SDT EDS EDS SDT/EDS HAIS
SDT	5.8 5.9 5.10 5.11	Architecture Modeling and Validation Initial Installation/Acceptance Plan Incremental Design Review Requirements Specifications	EDS EDS SDT SDT/EDS
Vendor Community SDT	5.12 5.13 5.14 5.15 5.16 5.17 5.18 5.19	Prepare Request for Proposals (RFPs) Prepare Evaluation Criteria RFP and Evaluation Criteria Review Release RFP Separate Cost and Technical Proposals Analyze and Rank Cost Proposal Evaluate & Score Technical Proposals Risk Assessment/Risk Management	EDS EDS EDS EDS EDS EDS EDS EDS
GSFC/HAIS	5.20 5.21	Prepare Low-Level Physical Design Finalize Installation/Acceptance Plan	EDS EDS/SDT
Vendor Community	5.22	Issue Purchase Orders to Vendors & Track Purchase Orders	EDS
GSFC/HAIS	5.23 5.24 5.25 5.26	Products Received/Inventory Equipment Install/Acceptance of Equipment Process Vendor Invoices/Prepare DD250 Manage Vendor Services	EDS EDS EDS EDS

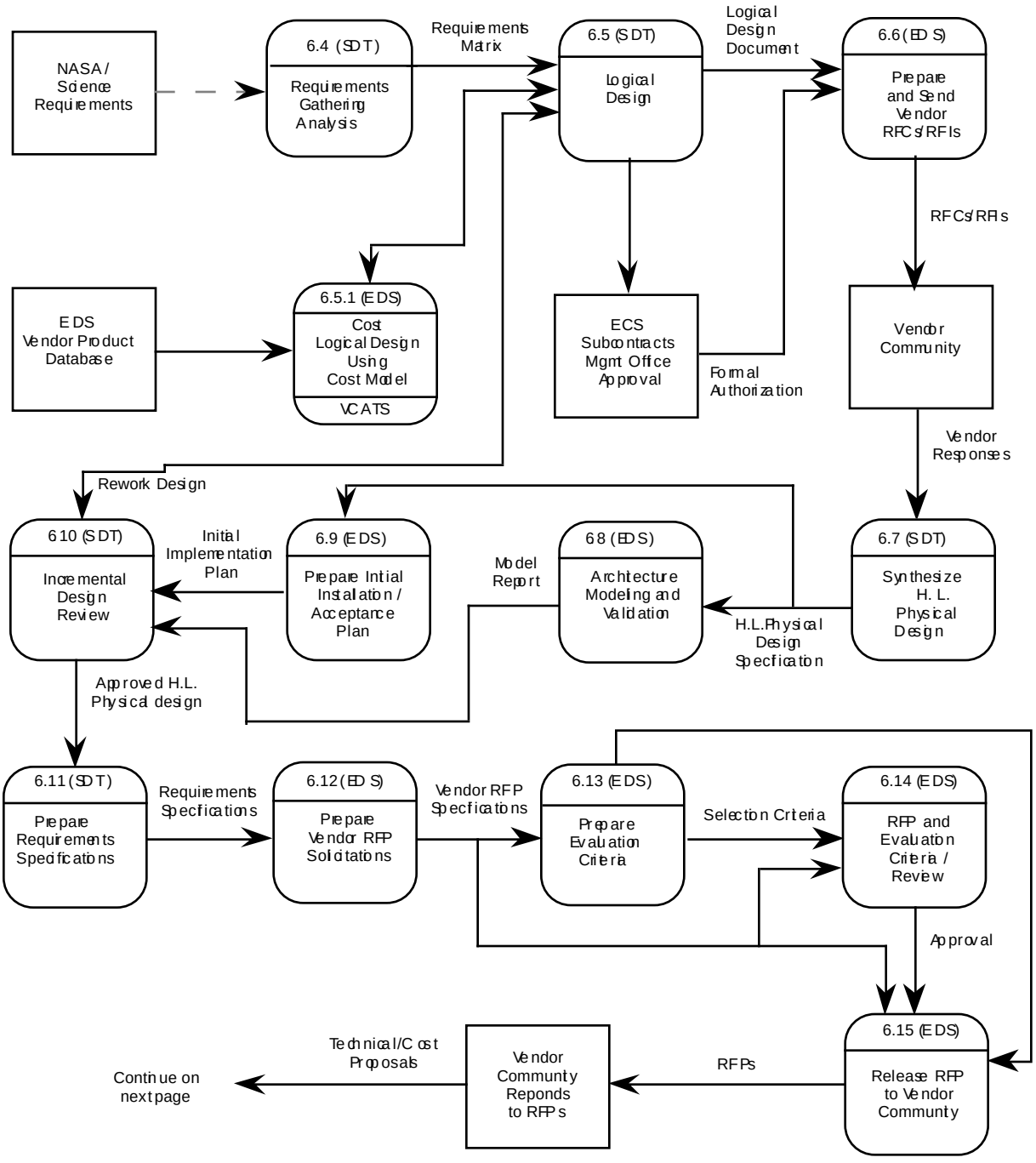

Figure 6-2. ECS Procurement Process Flow (1of 2)

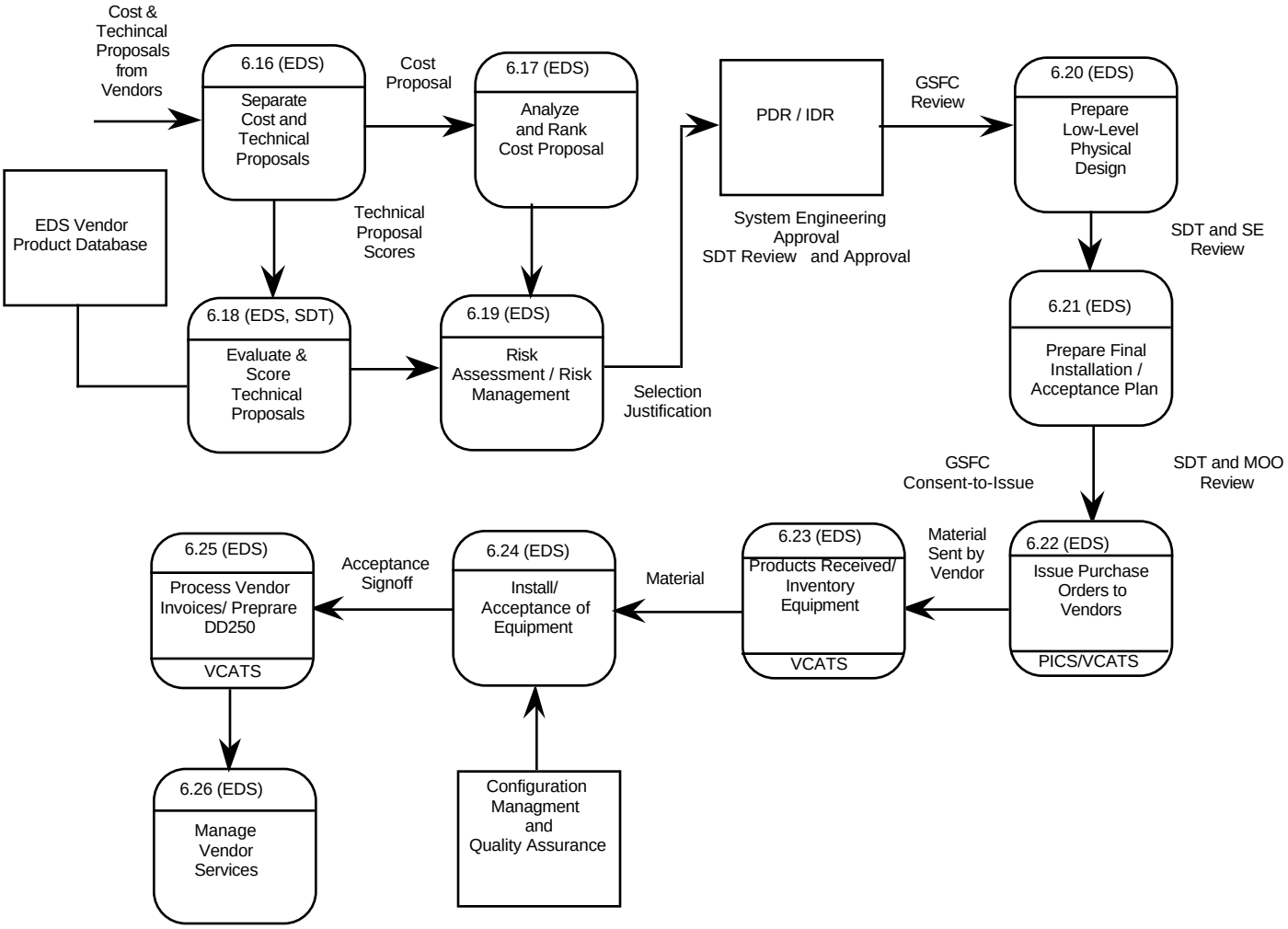

Figure 6-2. ECS Procurement Process Flow (2 of 2)

6.4 Requirements Analysis

The procurement process begins with the requirements analysis phase, which is accomplished through user participation and feedback to EDS and is generated via the three segment design teams (SDTs): Science Data Processing Segment (SDPS), Flight Operations Segment (FOS), and the Communications and Systems Management Segment (CSMS). Recommendations from the user community are screened and assessed to understand the full scope of technical, schedule, and cost implications. Acceptable requirements are allocated to the appropriate segment, where each requirement is studied in relationship to all others and the functionality of the proposed system is formed into the logical design.

6.5 Logical Design

EDS' participation on the SDT as "COTS champion" ensures that the best value will be obtained for the functionality proposed. Because ECS is being designed as an evolutionary open architecture, technology assessment is a critical process that can take advantage of the latest in technological advances. The objective of the technology assessment is to research, evaluate, and forecast new technologies that may effect the ECS hardware and software procurement process. The technology assessment process provides input to each SDT during the logical design and specification definition phases so that appropriate technologies are requested and selection criteria are defined in order to achieve the best cost, minimal risk and best technical solution for the ECS Project. Figure 6-3 illustrates the interaction between technology assessment and the logical design phase.

Additionally, EDS participation in the logical design provides valuable input regarding functionality of the design relative to cost. If the functionality cannot be provided at a reasonable cost, other solutions can be identified, analyzed, and costed. During the logical design, potential roadblocks to satisfying functional and performance requirements are identified. Analysis of the design verifies that a path exists to all data and confirms that all transactions meet performance requirements. Simulation models and database simulation tools define the initial physical structures; distribution models determine the best location for data and the degree of data replication required.

6.5.1 Cost Modeling

The functionality proposed in paragraph 6.5 can be costed to make certain it can be provided within a budget threshold. Costing is integrated into the design process, is interactive and automated, and ensures that the proposed solution is “designed to budget,” as well as designed to required functionality.

The cost model is a component of the Vendor Costing Automated Tracking System (VCATS) database, which provides prompt feedback to the designers. The advantage of integrating cost into the process is that designers are able to work with a variety of designs while recognizing the budget implications immediately. This ensures that the proposed functionality is attainable at a reasonable cost. (Reference paragraph 6.14 for more information on the VCATS database.)

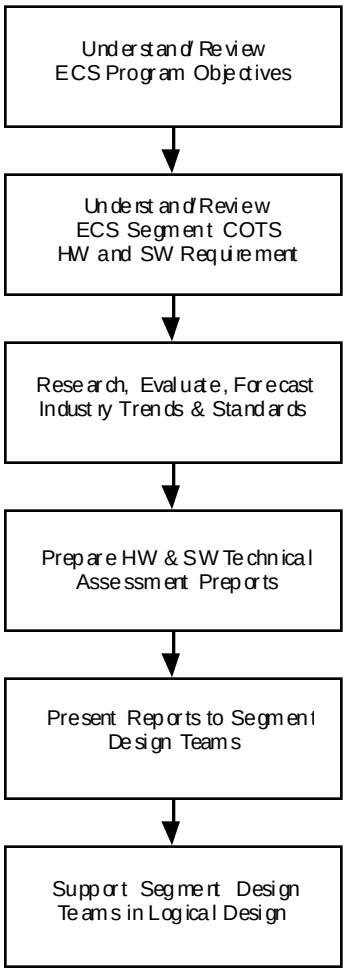

Figure 6-3. Technology Assessment

6.6 Prepare Vendor Request for Information/Comment (RFI/RFC)

The purpose of the RFI is to explore ways in which the functional requirements can be met by utilizing a variety of technologies. Upon receipt of the initial technical requirements from the segment managers, the EDS procurement management team will prepare the RFI.

The RFI results in the collection of a considerable volume of information about product capabilities and availabilities. It will contain a set of requirements or questions that describe the customer's intent and asks the vendor community to comment about the feasibility of these specifications and their approach to the requirements. In addition to gathering information, the RFI also notifies the vendor community that a hardware/software acquisition is under consideration. This raises vendor awareness and can result in a clearer response to the final solicitation when it is issued. The decision to issue a RFI is primarily based on whether the acquisition is for items of high value, or those of which are technically complex or entail highly specialized procurements.

All information regarding the vendor, including product name, model, availability, warranty terms and cost will be maintained in the VCATS database. This database will allow for easy retrieval of product and vendor information.

As the EDS procurement management team receives responses to the RFI, they will be forwarded to the EDS technical teams for evaluation follow-up and reviewed with the SDT.

As requirements and specifications become defined and the solicitation is close to being released, a decision will be made based on the type of procurement as to the need of a RFC. Like a RFI, a RFC will always be issued for items of high value, or those of which are technically complex or entail highly specialized procurements. The RFC allows the vendor to respond with questions, and ask for clarification. The RFC informs the vendor that a RFP is forthcoming. The RFC also contains draft specifications necessary for prospective vendors to prepare their proposals. By responding to vendor questions and clarifying issues, we can be ensured that when the solicitation is released we will receive clear, concise proposals from the vendor community. When the RFC is released to the vendor community it is also routed to Hughes and to GSFC for review and comment.

6.7 Synthesizing the High-Level Physical Design

Led by EDS, the SDT, "synthesizes," (or combines), similar functionalities specified by the logical design. The result of the process is a high-level physical design document. The high-level design is not vendor-specific. It identifies physical data locations, data characteristics and storage organization. Reliability, maintainability, and availability (RMA) requirements and analyses are performed at each design level, and the results of the analyses are presented at each design review. The results are then used to develop detailed maintenance plans and operation procedures. The RMA product data is continually documented and updated throughout the contract life cycle.

6.8 Architecture Modeling

The high-level physical design is validated through architecture modeling as conducted by the performance technology group. This process substantiates the physical design.

6.9 Initial Installation and Acceptance Plans

At the same time the design is validated by architecture modeling, the integrated logistics support (ILS) group prepares the initial installation plan and the initial acceptance plan. These initial plans represent an outline, which will be updated and completed once vendor equipment has been selected and approved for purchase The installation plan contains information obtained from the site (i.e., data pertaining to the existing computer center, operations area, storage and data areas, etc). The acceptance plan incorporates data provided by the SDT in the form of the segment and element integration and test procedures report. An overall installation and acceptance testing schedule is also prepared.

6.10 Incremental Design Review (IDR)

The IDR, attended by Hughes, EDS, and GSFC, is a culmination of the feedback process and provides the groups with a formal forum for system critique. This review is a checkpoint which will determine if the design is satisfactory and work should continue or if re-evaluation is needed.

6.11 Prepare Requirements Specifications

Once the design has been approved, the SDT, with EDS as the lead, will prepare vendor specifications from the requirements matrix developed during the logical design. In addition to preparing these specifications, a justification for each requirement is also furnished to ensure traceability of system requirements back to the logical design. By providing justification for each requirement, any “extras” in the design due to personal judgment are eliminated. The design will be specific to the requirements.

It is important that these specifications are complete, yet do not suggest a given solution. The competition is open to all vendors who can meet the stated requirements. The VCATS database is used to provide a baseline for generic product requirements, thus ensuring fair and open competition for every procurement cycle.

6.12 Prepare Vendor Request for Proposal (RFP) Solicitation

When all specifications have been approved by the SDTs, the ECS/EDS procurement management team will begin to prepare the RFP. The RFP will be carefully prepared to generate both maximum competition and the industry’s best efforts to meet the buyer’s needs. The solicitation will be prepared to:

- Facilitate full and open competition
- Allow technical evaluators of proposals to consider technical merit and/or value added above the minimum required by the specifications

- Ensure the development of fair evaluation criteria
- Document and track the source selection process

Upon completion of the solicitation package, the review cycle will begin. The RFP will be formally routed to designated members of the SDTs, Chief Engineer, Business Operations and Subcontract Administration. The RFP is also delivered to GSFC's Contracting Officer for review, approval, and consent to release.

6.13 Prepare Evaluation Criteria

Evaluation criteria are the measures used to evaluate the factors/subfactors/elements of the solicitation. The objective of these measures is to provide the technical and cost evaluation teams with the criteria to determine how well an offeror's response meets the evaluation requirements of the solicitation. The minimum requirements of a criterion must not exceed those specified as minimally acceptable in the solicitation, and must not address requirements not included in the solicitation. In developing factors, EDS will consider those used in the requirements analysis, as these requirements are generally valid factors for determining a proposal's relative technical merit. They also form the basis for identifying what is critical to the success of the procurement. The SDTs and the procurement management team will work closely to develop the criteria to best suit the requirements of the solicitation.

6.14 RFP and Evaluation Criteria Review

The Vendor Costing Automated Tracking System (VCATS) provides a standard evaluation form for each equipment category, as illustrated in the Standard Evaluation Form for Tape Cartridges, Table 6-2. By maintaining baseline evaluation criteria in the database, standardization of product measure is achieved. For each procurement, the evaluation team must determine how ratings will be given a particular feature. Guidelines need to be established based on specific design, its requirements and their justifications. Interaction with the SDT is imperative at this point to ensure that the requirements and their justifications are completely understood.

Criteria are deemed either "mandatory" or "desired" based on the requirements. Mandatory requirements will be assigned a "pass/fail" score; in other words, the product must meet all mandatory requirements in order to continue in the evaluation process. The desirable requirements will be prioritized and assigned a weight factor. The weight is a measure of importance of a feature. When it makes sense, a dollar value will be attached to features proposed that exceed the stated requirements. This will allow the evaluation team to determine the product with the best value. Low bid is not necessarily the best product. For example, if the requirement calls for a product with a 1 megabyte transfer rate and the vendor supplies a product with a 1.8 megabyte transfer rate, the value of the "extra" supplied by the vendor must be factored in. For some features, the "extra" may be of no added value to the solution.

Other factors that will be considered and scored as appropriate, include past performance, particularly on projects of similar scope and size; degree of installation and maintenance support; and completeness and clarity of the overall proposal.

6.14.1 Vendor Costing Automated Tracking System (VCATS)

VCATS is a comprehensive database system which automates the COTS procurement process. It maintains information, including life cycle costing, about all vendors and products that could be of service to ECS.

Information in the database is retrieved by "equipment type;" each record is assigned an equipment category (equipment type). Currently over 30 classes of computer hardware, mass storage, communications and peripheral COTS hardware products have been identified and are maintained. VCATS has the following components:

- Cost model
- Vendor identification
- Evaluation criteria for equipment types
- Purchase order tracking

As technology changes, the database is updated. New equipment types are easily added. Price information, maintenance costs, product specifications, benchmark results, physical space and environment specifications, and life cycle costing are among the many other fields maintained and available for query. The overall purpose of VCATS is to ensure a “design to cost” methodology.

Table 6-2. Standard Evaluation Form for Tape Cartridges

Mandatory Desired	Criteria		Weight Factor
	Type	Cartridge Reel	
	Capacity	Device Recording	
	Transfer Rate		
	Ramp Up/Ramp Down Time		
	Operation	Streaming Start/Stop	
	Search Time	Index Dead Reckoning Full-Width Serpentine	
	Bit Error Rate	Raw After Connection	
	Tape Life	Number of Reads Number of Passes Age	
	Block Size	Fixed Variable	
	Bus Interface	Open Systems Specific	
	Software Drivers	Provided Write Your Own	
	Diagnostics	Executable Linkable Pass/Fail LRU Chip Ease of Use Operation	
	Sensitivity	Voltage Heat Humidity Frequency	
	Concurrent Use	Search Read/Write	
	Operation	Read After Write Electronic De-skewing	
	Maintenance	MTBF MTTR Spares Response Time Close Depot Frequency of PM	
	Cooling Requirements	BTUs	
	Power Consumption		
	Size of Unit		
	Upgradeable		
	Vendor Support		
	Vendor Reputation		
	Expandable		

6.14.1.1 Cost Model of Physical Design

Costing of the physical model is achieved through the VCATS database. Each equipment type is assigned a performance range and an average price. The parameters of the high-level physical design are input and costed. This provides feedback to the SDTs to assist them in producing a "design to cost." The low-level physical design is easily costed by using the pricing information for the specific products. Equipment life, depreciation, maintenance, and other factors relating to equipment cost over its life cycle are maintained. This allows VCATS to provide costing over the life of the contract.

6.14.1.2 Vendor Identification

Vendors are easily identified using VCATS by submitting a query for a particular equipment type. For example, if the SDT requested information on RAID (redundant array of inexpensive disks) technology, a query is submitted to the database specifying equipment type = RAID.

6.14.1.3 Evaluation Criteria

Evaluation criteria for each major category of equipment type is maintained through VCATS. This ensures standardization when evaluating products. The baseline is developed through meetings and discussions between the SDTs and EDS. A sample of the form generated by this database is illustrated in Table 6-2.

6.14.1.4 Purchase Order Tracking

VCATS has been developed to interface with EDS' government-approved contractor purchasing system. By automating the interface, the purchasing process becomes more reliable and correct. Purchase orders will be traced from the day of issue. EDS will provide a weekly status on all outstanding purchase orders.

6.15 Release of RFP to Vendor Community

After the evaluation criteria have been determined and the solicitation package is complete, the final review cycle will begin. The RFP will be formally routed to designated members of the SDTs, Chief Engineer, Business Operations and Subcontracts Administration. The RFP is also delivered to NASA's Contracting Officer for review, approval, and consent to release. Once approved, the RFP will be released to the vendor community.

A direct relationship exists between the quality of the RFP and the quality of the offers received. Therefore, the RFP will be carefully prepared to generate maximum competition and the industry's best effort to meet the Buyer's needs. Proposals must be received by the designated date and time to be considered responsive to the RFP. All proposals received, via mail or hand-delivered, must be marked with the time and date of delivery. Proposal control and security rules will be followed for both proposal contents and communications with offerors.

6.16 Separate Cost and Technical Proposal

Once the proposals are submitted to EDS by the vendor, costing will be evaluated separately from the technical requirements. Proposals will follow the evaluation process, as set forth in Figure 6-4.

Upon receipt of the proposal, EDS will perform a preliminary validation. Offerors who are non-compliant will be notified. Next, a minimum evaluation will be conducted and once again offerors who are non-compliant will be notified. EDS' Corporate Contracts & Legal Department will review the proposed contract to ensure that it satisfies all legal and regulatory requirements. Proposals meeting minimum mandatory requirements will then be further evaluated to determine and score the technical and cost proposals.

6.17 Analyze and Rank Cost Proposal

The costing evaluation will be conducted by the EDS Procurement Management team with assistance from the technical evaluation team. Technical evaluators will not review the cost proposals until after scoring of the technical proposals is complete. The cost evaluation will occur at the time of the technical evaluation and generally after a proposal has met minimum mandatory requirements. This evaluation verifies that the submitted pricing includes all mandatory specifications and that all contractual issues have been met.

6.18 Evaluate and Score Technical Proposal

The EDS technical team and the SDT will receive technical proposals from the EDS procurement management team. Using the evaluation process described in paragraph 6.14, the technical team begins scoring each submission based on its technical merits. Factors such as vendor stability and financial position, vendor support, product training, and documentation are included in the evaluation criteria.

Using the weight factors and dollar values assigned, the technical scores are recorded. When the vendor offers a feature that is deemed a benefit to the program, the extra value will be converted into total dollars. This additional value will be incorporated into the total life cycle cost. A "Best Value" is the sum of technical score, price rankings, and the "extra" capability provided by each vendor. "Best Value" is the basis for contract awards.

Benchmarking and stress testing will not be performed for all products. EDS will require vendors to certify their compliance with applicable federal and ECS standards, appropriately including witnessed runs of compliance suites. In addition, vendor claims are evaluated by the Hughes/EDS team through prototyping in the science and technology laboratory (STL). Many of the vendors responding to the RFPs will have hardware and software available "for evaluation" at the STL, thus providing the opportunity for hands-on testing against requirements.

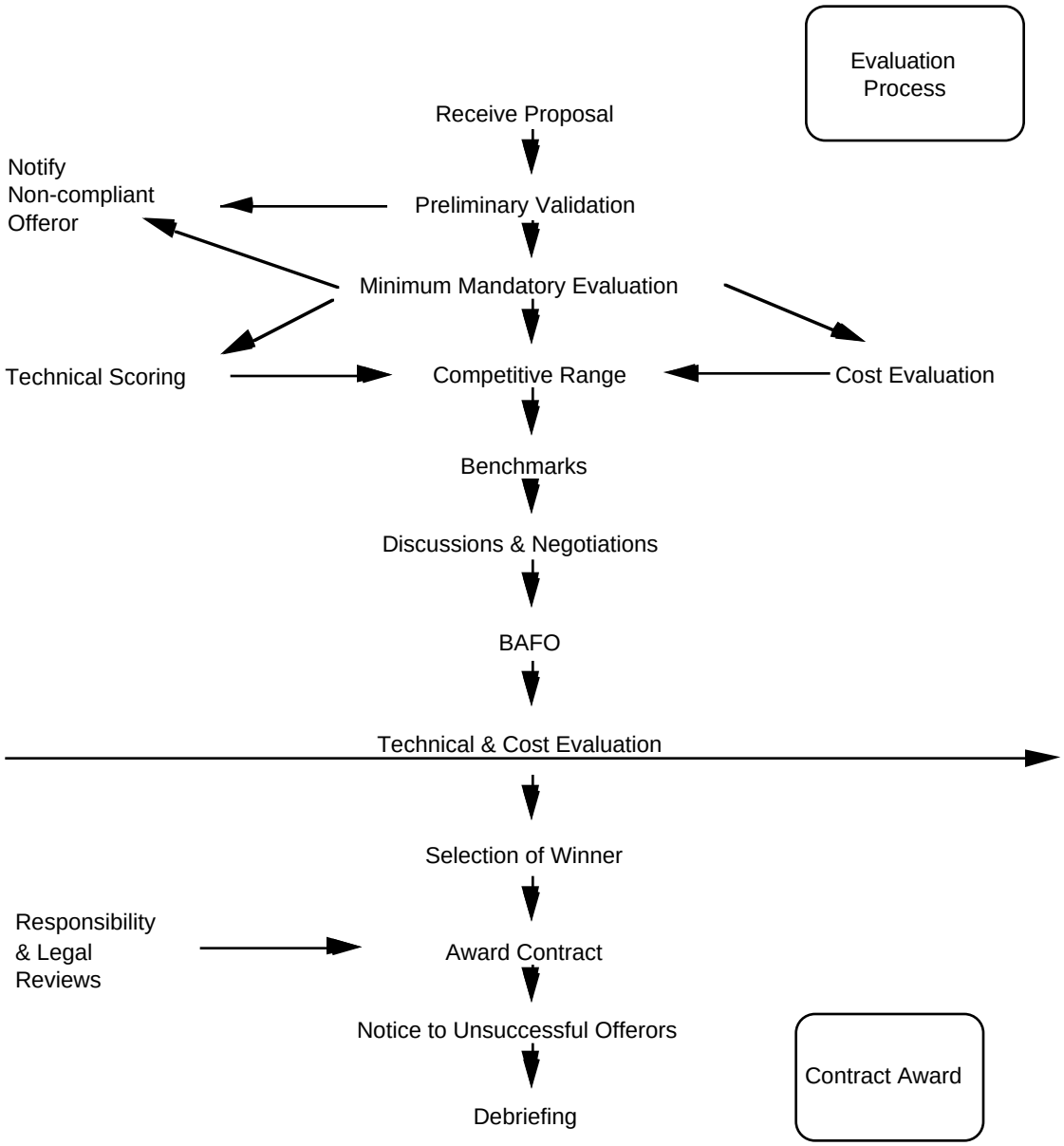

Figure 6-4. Representative Evaluation Process

EDS, upon completion of the technical and cost evaluation will prepare a Source Evaluation Recommendation report. This report will provide an overview of the requirement and the segment(s) that the acquisition will support. The report will also provide an overview of the technical and price evaluation and the recommendation to purchase. The Source Evaluation Recommendation will be formally routed to designated members of the SDTs, Chief Engineer, Business Operations and Subcontracts Administration. The Source Evaluation Recommendation, as well as the negotiated subcontract are delivered to GSFC's Contracting Officer for review, approval, and consent to issue.

The procurement management team will debrief all unsuccessful offerors. The specific information that can be provided during debriefing will be limited to the specific strengths and weaknesses of an offeror's proposal and a general explanation of the evaluation methodology.

6.19 Risk Assessment and Risk Management

Because ECS is being designed as an evolutionary, open architecture, many new technologies will be proposed. There is a risk factor associated with the type of technology utilized by the project. When time-tested hardware and software are implemented, the implementation and operation can be predicted. When newer technology is implemented, the probability of problems occurring during implementation and operation is greatly increased.

The trade-off between new technology and existing technology must be taken into consideration during the design phase. As the technology evolves, the product stabilizes. The government requires technology to comply with certain standards. There will be times when the technology is so new, compliance to existing standards will be partial or non-existent. EDS will notify the SDTs of the level of compliance and the risk associated with the new technology known to the customer during the logical design phase (see paragraph 6.5).

Successful risk management identifies risks before a program impact occurs. Timely identification permits responsive risk mitigation and contingency plans to be initiated. This process is supported by proactive communication throughout the ECS Project community in order to formulate a cooperative risk management strategy.

6.20 Low-Level Physical Design

Once the vendors have been selected and approved, the low-level physical design is to be performed. This process replaces the generic equipment requirements from the high-level physical design document with physical equipment specifics. For example, if there is a requirement for two servers to communicate, the high-level design would indicate just that where the low-level design would specify a specific cable and software product. This design must be reviewed and approved by the SDT as well as ECS System Engineering.

6.21 Final Installation/Acceptance Plan

Using the low-level physical design document, the initial installation and acceptance plans (see paragraph 6.9) are now finalized and approved by ECS System Engineering and Maintenance and Operations.

6.22 Issue Purchase Order to Vendor

EDS will issue a purchase order to the selected vendor. The purchase order is then generated and tracked via the corporate-based, but project-controlled, EDS contractor purchasing system (CPS). This automated procurement system was approved by the Defense Contract Management Area Operations-Philadelphia (DCMAO-Philadelphia) on 1 March 1993. A key internal feature of CPS is the procurement and inventory control system (PICS), which provides on-line status of each purchase order. Additionally, the procurement process will be recorded and tracked via the VCATS database, as described in paragraph 6.14. VCATS will interface with PICS to execute purchase orders to vendors. EDS will ensure that vendors respond to the schedule requirements that are stated in the purchase order. In the event that a vendor does not comply with the scheduled requirements stated in the purchase order, EDS will obtain consideration, as appropriate from the vendor.

When a solicitation is awarded or a purchase order has been issued, a contract file will be kept to include historical background on the purchase action. This file will provide an audit trail as well as a useful tool for analysis of past trends and results. The contract file will show the description of services, type of solicitation, a well-defined statement of work, delivery schedules, shipping terms, invoice and payment terms, flowdown clauses, amount or estimate of purchase, description of evaluation criteria, and persons to contact if questions arise. The contract file will demonstrate through documentation that all purchasing actions have been made in accordance with acceptable government procedures, as well as practicing fair and open competition.

6.23 Products Received/Inventory Equipment

The EDS Integrated Logistics Support (ILS) team is responsible for ensuring that ECS can be logistically supported at the least life-cycle cost. ILS' role ensures that products received from selected vendors are properly received, inventoried, and installed.

ILS provides product tracking to maintain accountability of COTS hardware, software, and its related documentation throughout the procurement cycle. This includes configuration management of the hardware, software, and its related documentation. It also includes maintaining accountability of vendor-loaned prototype equipment.

Responsibility for COTS product tracking during the procurement cycle is shared between the EDS procurement manager and the ILS manager. COTS product tracking begins with the receipt of hardware, software, and documentation by the EDS ECS Logistics Support Office (LSO). At that time, COTS products are inventoried against the EDS purchase request to verify correct and complete delivery of the order. Products are inspected for damage, bar coded, reported to the procurement office and to the Logistics Management Support (LMS), and secured until

installation or use. COTS products are reported by item description, vendor, model number, serial and bar-code number, and location.

6.24 Install/Acceptance of Equipment

The ILS team accepts all vendor shipments, documenting product reliability, addressing service requests, and tracking vendor performance in a maintenance database. If the product received is hardware, all internal tests and diagnostics will be performed per the manufacturer's specifications.

6.24.1 Configuration Management and Quality Assurance

ILS is responsible for the configuration management and quality assurance controls for ECS hardware and software acceptance. Following the QA procedures and the completion of the appropriate site surveys, ILS will install the COTS products at the DAACs and the EDF facility requirements definition will be provided to the Government in compliance with DIDs 303/DVI and 302/DVI.

Subsystem integration of each new hardware item and testing of the subsystem to verify the I/O connections and LAN connections are functional. The test also ensures that no degradation of the existing system is occurring. The process of adding one new component, whether it be hardware or software, and verifying its functionality, will be repeated to verify and test the LAN configuration, as well. This methodology will allow for the specific isolation of problems and allow for a rapid response to potential issues.

Once the interaction between the hardware, software, and LAN have been proven effective and efficient, the system is certified as being completed by EDS. The tested and installed system is then delivered to the customer. During the acceptance period while the customer is using the system, EDS will provide technical support to the site. This comprehensive support will include all aspects of hardware and software and their interactions. This will provide a stable environment to ensure rapid response to any issue.

6.25 Process Vendor Invoices

EDS will process invoices for payment to vendors by accessing the EDS corporate-based but project-controlled accounts receivable invoice control system (ARICS). ARICS ensures that vendor billing is accurate and payment is only generated after the receipt and inventory of equipment. Payment will be according to the terms specified in the EDS internal purchase request. These terms may specify that payment must await further information, such as, but not limited to, completion of successful acceptance testing or Ready For USe (RFU). EDS' ILS team will conduct acceptance testing and generate the RFU certificate. Acceptance testing consists of determining that the equipment ordered functions as specified and is configured as stated in the purchase order. ILS will forward the completed RFU certificate to Hughes.

6.26 Manage Vendor Services

EDS will begin to manage vendor services/performances immediately after the contract has been awarded and purchase order issued. The objective will be to verify that a vendor's performance fulfills the contract requirements, terms, and conditions. EDS will ensure that vendors conform to the specifications in the statement of work. For example, EDS will track to make certain that equipment is received on schedule, that maintenance is performed on schedule, and that escalation procedures are followed. Problem tracking will control and minimize vendor-related problems.

Abbreviations and Acronyms

AO	Announcement of Opportunity
ARC	Applied Research Corporation
ARICS	accounts receivable invoice control system
BAFO	Best and Final Offer
BTU	British thermal unit
CCB	Configuration Control Board
CDR	critical design review
CESDIS	Center of Excellence in Space Data and Information Sciences
COTR	contracting officer's technical representative
COTS	commercial off-the-shelf
CPS	contractor purchasing system
CPSR	Contractor Purchasing System Review
CR	clarification requests
CSAT	Center for Space and Advanced Technology
CSMS	Communications and Systems Management Segment
CWBS	contract work breakdown structure
DAAC	Distributed Active Archive Center
DCMAO	Defense Contract Management Area Operations
DCN	document change notice
DID	data item description
DOS	Director of Subcontracts
ECS	EOSDIS Core System
EDF	electronic data facility
EDS	Electronic Data Systems
EOSDIS	Earth Observing System Data Information System
F&AG	Finance and Administration Group
FAR	Federal Acquisition Regulation

FOS	Flight Operations Segment
GSFC	Goddard Space Flight Center
HAIS	Hughes Applied Information Systems, Inc.
HBCU	Historically Black Colleges and Universities
HTSC	Hughes Technical Services Company
HW	hardware
IDR	Incremental Design Review
IED	Infrastructure Engineering Division
LAN	local area network
LMS	Logistics Management Support
LRU	lowest replaceable unit
LSO	Logistics Support Office
MI	Minority Institutions
MTBF	mean time between failure
MTTR	mean time to repair
NASA	National Aeronautics and Space Administration
NRC	National Research Council
PDR	preliminary design review
PEB	Performance Evaluation Board
PICS	procurement and inventory control system
PM	preventative maintenance
PMS	Performance Measurement System
RAID	redundant array of inexpensive disks
RFC	request for change
RFI	request for information
RFP	request for proposal
RFU	ready for use
RMA	reliability, maintainability, and availability
SBA	Small Business Administration
SDPS	Science Data Processing Segment

SDRD	subcontract data requirements document
SDRL	subcontract data requirements list
SDT	segment design teams
SM	subcontract manager
SMO	Subcontract Management Office
SOW	statement of work
SSB	Source Selection Board
STL	science and technology laboratory
SW	software
TAD	Technology Architecture Division
TSG	Technical Support Group
USRA	Universities Space Research Association
VCATS	Vendor Costing Automated Tracking System
VIS	Vendor Information System
WBS	work breakdown structure